Recent Advances in Science in Western Australia

Life Sciences

An analysis of the distributions of terrestrial mammals, birds and reptiles for north-western Australia by J Woinarski, of the Conservation Commission of the Northern Territory/CSIRO Division of Wildlife and Ecology, shows that diversity is highest in coastal, high rainfall zones compared to transitional and inland, low rainfall zones. The mammal/bird/reptile assemblages of the coastal zone are well represented by the 58 nature reserves of the region, but transitional and inland assemblages are poorly represented.

Woinarski J C Z 1992 Biogeography and conservation of reptiles, mammals and birds across north-western Australia: an inventory and base for planning an ecological reserve system. Wildlife Research 19:665-705.

Differences in foliar nutrient levels for two co-dominant eucalypts at sites in western and eastern Australia, measured by J Majer and S Ganeshanandam (Curtin University of Technology) and H Recher (University of New England) reveal differences that are consistent with trends in the abundance and diversity of foliage arthropods and foraging use of trees by birds.

Majer J D, Recher H F, & Ganeshanandam S 1992 Variation in foliar nutrients in *Eucalyptus* trees in eastern and Western Australia. Australian Journal of Ecology 17:383-393.

An extensive 2 year study by I Abbott and co-workers from the Research Centre, CALM, of arthropod jarrah crown fauna in 7500 km^2 centred on Manjimup revealed more than 396 species, predominated by leaf chewer, sapsucker and predator guilds. There was no apparent single pattern of organization or predictable assemblages of these jarrah foliage invertebrates.

Abbott I, Burbidge T, Williams M, & Van Heurck P 1992 Arthropod fauna of jarrah (*Eucalyptus marginata*) foliage in mediterranean forest of Western Australia: spatial and temporal variation in abundance, biomass, guild structure and species composition. Australian Journal of Ecology 17:263-274.

The history of the rodent fauna of Australia has been examined by C Watts and co-workers, of the South Australian Museum and University of New England (Northern Rivers). Albumin evolution, determined using microcomplement fixation, has not occured in a clock-like manner. The genera *Conilurus*, *Leporillus* and *Mesembriomys* form a monophyletic group, as do *Notomys*, *Mastacomys* and *Pseudomys*. The genus *Mastacomys* was synonymised with *Pseudomys*, which is polyphyletic.

Watts C H S, Baverstock P R, Birrell J, & Krieg M 1992 Phylogeny of the Australian rodents (Muridae): a molecular approach using microcomplement fixation of albumin. Australian Journal of Zoology 40:81-90.

The impact of fire upon the predominant frogs of *Banksia* woodland has been examined by M Bamford, near Perth. Recent fire did not greatly affect the numbers of *Heleioporus eyrei*, but did decrease the numbers of *Limnodynastes dorsalis*, and to a lesser extent the numbers of *Myobatrachus gouldii*.

Bamford M J 1992 The impact of fire and increasing time after fire upon *Heleioporus eyrei*, *Limnodynastes dorsalis* and *Myobatrachus gouldii* (Anura: Leptodactylidae) in *Banksia* woodland near Perth, Western Australia. Wildlife Research 19:169-178.

Earth Sciences

R Salama and co-workers of the Division of Water Resources, CSIRO (Wembley), describe the geochemical evolution of Lake Deborah East, a playa lake with a thick salt crust underlain by stratified lacustrine deposits of unconsolidated evaporite minerals intercalated with clay and sand; the sequence is of Late Tertiary and Quaternary age. Evidence from the salt budget of prolonged arid periods, with no salt addition, is consistent with other lines of evidence for frequent dry periods during the last 400,000 years.

Salama R, Barber C, Hosking J, & Briegel D 1992 Geochemical evolution of Lake Deborah East, prototype salt lake in the relict drainage of the Yilgarn River of Western Australia. Australian Journal of Earth Sciences 39:577-590.

I Williams of the Geological Survey of Western Australia provides the first description of a newly recognised 900-600 Ma Proterozoic sedimentary basin in the Little Sandy Desert region east and southeast of Newman. The Savory Basin is situated between the Pilbara and Yilgarn Cratons and unconformably overlies the eastern part of the Middle Proterozoic Bangemall Basin, and is unconformably overlain by Phanerozoic rocks of the Officer Basin. The Basin fill is predominantly arenaceous and includes an important geological sequence, biostratigraphically significant stromatolitic dolomites, and evaporite occurrences.

Williams I R 1993 Geology of the Savory Basin, Western Australia. Western Australian Geological Survey, Bulletin 141.

In a valuable study of the Menzies-Kambalda area of the Archaen Yilgarn Craton which has yielded large quantities of gold, W Witt of the Geological Survey of Western Australia describes structurally-controlled gold mineralization in a wide variety of host rocks and structural settings. Mineralized structures in the host rocks, which are predominantly Fe-enriched basalt and fractionated zones of mafic to ultramafic sills, can generally be related to the latest events in the regional deformation history of the greenstone belt or forceful emplacement of contemporaneous granitoid intrusions.

Witt W K 1993 Lithological and structural controls on gold mineralization in the Archean Menzies-Kambalda area, Western Australia. Australian Journal of Earth Sciences 40:65-86.

Relict channels in three representative dryland salinized wheatbelt catchments were identified by R Salama and co-workers of the Division of Water Resources, CSIRO (Wembley) using aerial photographs. These relict channels generally have a higher salinity than other areas in the catchment and downstream, and have an important role in the storage and redistribution of salt.

Salama R B, Farrington P, Bartle G A, & Watson G D 1993 The role of geological structures and relict channels in the development of dryland salinity in the wheatbelt of Western Australia. Australian Journal of Earth Sciences 40:45-56.

As part of a revision of fossil floras in Western Australia, S McLoughlin of the University of Western Australia considers the systematics, morphology, and distribution of newly collected sphenophyte fossils from the Collie and Irwin Coal

Measures. Symmetrical *Sphenophyllum* species were predominant in the Early Permian whereas bilaterally symmetrical *Trizygia* or bifid-leafed *Benlightfootia* species dominated the Late Permian.

McLoughlin S 1992 Permian sphenophytes from the Collie and Perth Basins, Western Australia. Review of Palaeobotany and Palynology 75:153-182.

This study of goniatite (cephalopod) faunas in Western Australia, by R Becker, M House and W Kirtgasser (Southampton University and State University of New York), provides an important contribution to world-wide stratigraphic correlations. Their new goniatite classifications of the Frasnian reef and detailed zonations for the Canning Basin provide a framework for analysis of facies movements and recognition of several international eustatic sea-level changes.

Becker R T, House M R, & Kirchgasser W T 1992 Devonian goniatite biostratigraphy and timing of facies movements in the Frasnian of the Canning Basin, Western Australia. In: High Resolution Stratigraphy (eds E A Hailwood & R B Kidd) Geological Society Special Publication 70, 293-321.

A special issue of Precambrian Research, edited by T Blake and A Meakins of the University of Western Australia, discusses some recent developments in Archaean and Early Proterozoic geology of the Pilbara region. The editorial preface sets the scene for a new approach to Early Precambrian geology, and the eleven papers provide valuable debate on topics including stratigraphy, geochronology, sedimentology-volcanology, plutonic rocks and tectonics of the granite-greenstone terrain and the Hammersley Province.

Blake T S & Meakins A 1993 Archaean and Early Proterozoic geology of the Pilbara Region, Western Australia. Precambrian Research, Special Issue 60, 1-359.

Physical Sciences

A group of physicists, chemists and electronic engineers at Murdoch University and The University of Western Australia have used Fourier transform infra-red spectroscopy to study how temperature affects the nature of bonding in thin films of hydrogenated amorphous silicon, an important photovoltaic material. Hydrogen was found to evolve from near-surface and bulk sites at different temperatures, and the bonding of contaminant oxygen and nitrogen moieties in the silicon network also undergo changes with temperature.

Talukder G, Cornish J C L, Jennings P, Hefter G, Jain M, Robins J L & Livingstone J 1993 Annealing effects on hydrogen, oxygen and nitrogen bonding in sputtered a-Si network. Thin Solid Films 223:167-172.

J Williams from The University of Western Australia and M Kumar and A Stelbovics of Murdoch University report measurements and associated theory for the angular correlations of sequential cascading photons for an atomic system (hydrogen) in which a scattering plane is defined. The measured angular correlations and the derived multipole moments show reasonable agreement with various theoretical models

Williams J F, Kumar M & Stelbovics A T 1993 Angular correlations between sequential cascading photons from n=3 atomic hydrogen. Physical Review Letters 70:1240-1243.

Physicists at Murdoch University show by calculation that the experimentally difficult Auger Electron Coincidence spectroscopy is better performed using X-ray excitation, although it is technically feasible using electron excitation.

Stelbovics A T, Todd B D, Thurgate S M & Lohmann B 1992 Limits to Auger-electron core-loss electron coincidence spectroscopy. Surface Science 278:193-201.

Note from the Hon Editor: This column helps to link the various disciplines and inform others of the broad spectrum of achievements of WA scientists (or others writing about WA).

Contributions to "Recent Advances in Science in Western Australia" are welcome, and may include papers that have caught your attention or that you believe may interest other scientists in Western Australia and abroad. Papers in refereed journals, or books, chapters and reviews will be accepted. Abstracts from conference proceedings will not be accepted. Please submit short (2-3 sentence) summaries of recent papers, together with a copy of the title, abstract and authors' names and addresses, to the Hon Editor (c/o Western Australian Museum) or a member of the Publications Committee: Dr S D Hopper (Life Sciences), Dr A E Cockbain (Earth Sciences), and Assoc Prof G Hefter (Physical Sciences). Final choice of articles is at the discretion of the Hon Editor.

"Letters to the Editor" concerning scientific issues of relevance to this journal are also published at the discretion of the Hon Editor. Please submit a word processing disk with letters and suggest potential reviewers or respondents to your letter.

I wish to thank Associate Professor John Webb for his past service on the Publications Committee, and welcome Associate Professor Glenn Hefter (School of Mathematical and Physical Sciences, Murdoch University) as the new member of the Publications Committee representing the Physical Sciences. *P C Withers, Hon Editor, Journal of the Royal Society of WA.*